SECTION 61

HOT WATER HEATING PLANT

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61.1 REFERENCES

(61A) Code of Federal Regulations - 46 CFR Sub-chapter F

61.2 INTRODUCTION

This Section contains the Contractor Design and Provide general requirements for the oil-fired hot water heater and the electric hot water heater necessary to heat the Vessel.

For WSF Fleet-wide Standardization purposes, End No. 1 of the Vessel shall always be considered the bow, and this designation shall delineate port and starboard, fore and aft wherever they are addressed in the Technical Specification.

61.3 GENERAL

The hot water heating system shall be supplied from three (3) primary sources: Main Engine Jacket Water recovered heat, an Oil-fired Hot Water Heater, and an Electric Hot Water Heater. Waste heat recovered from the Main Engine jackets shall be the primary source of heat, supplemented automatically by the Oil-fired Hot Water Heater. The Electric Hot Water Heater is the backup heat source. See Section 59 of the Technical Specification for additional waste heat requirements. See Sections 12 and 60 of the Technical Specification for additional water heater and distribution guidance. See Section 75 of the Technical Specification for insulation requirements.

61.4 OIL-FIRED HOT WATER HEATER DESCRIPTION

Provide and install one (1) WEIL-MCLAIN, Model 1894, or equal, hot water heater. The Oil-fired Hot Water Heater shall be sized to carry all of the hot water heating, potable water heating, and Main Engine keep-warm heating loads described in Sections 12, 59, 60, and 64 of the Technical Specification. The Oil-fired Hot Water Heater shall have a thermal efficiency of at least 80-percent (80%) at both low and high firing levels and shall meet or exceed current emission standards. It shall operate on ASTM D975, Grade Low Sulfur No. 2-D diesel fuel. The heater package shall be supplied with a local control and instrument panel mounted on the skid, including all necessary safety shutdowns. The controls shall be fully automatic and modulate over the full firing range. Remote controls and indicators shall be in accordance with Section 99 of the Technical Specification.

The hot water heater shall be provided with (1) GORDON PIATT, Model R, Forced Draft Burner, or equal, set for use with #2 diesel fuel oil. The burner shall be fully modulated with pre and post purge. For WSF Fleet-wide Standardization purposes, provide FIREYE E-100 Flame Safeguard to match existing Washington State Ferries stock. Control system wiring shall match existing Washington State Ferries Fleet-wide installations. GORDON PIATT ENERGY GROUP, Diagram No. S1-90847-40, FO-E100/EP390-F4B-AS2 ~ *Control System Schematic Wiring* is a satisfactory example. Provide a burner control system schematic for WSF approval prior to the start of installation. The hot water heater shall be capable of operating under a slight negative pressure in the Engine Room when the Vessel is tied up and the Engine Room supply fans secured.

The Oil-fired Hot Water Heater shall be the secondary heat source after the waste heat recovered from the Main Engine Jacket Water Cooling System. The heater controls shall be set-up to allow the heater to automatically provide supplemental hot water to the system during periods when the waste heat recovery system is unable to keep up with hot water heating system demands or when the engines are secured. The heater controls shall fully support the proper operation of the Main Engine Jacket Water Cooling System.

The control system shall also allow the Oil-fired Hot Water Heater to operate as the primary heat source during extended periods when the Main Engines are secured.

61.5 ELECTRIC HOT WATER HEATER DESCRIPTION

Provide and install one (1) CHROMALOX NWH, Series 45, 300 kW maximum, or equal, hot water heater as a standby unit in case the Oil-fired Hot Water Heater fails or is secured for maintenance. The Electric Hot Water Heater shall be sized to heat the Pilothouses and Crew accommodation block zones above the Lower Vehicle Deck, and the EOS area **only**, not the entire hot water heating system.

The Electric Water Heater shall be of the circulation type. It shall be supplied with safety shutdown flow instrumentation so that element energizing will not occur without proper circulation through the unit. The heating elements shall be tubular type fabricated of corrosion resistant materials and shall be flange mounted. The heating chamber shall be carbon steel. The heater elements shall be arranged for 480Vac, 3-phase power.

The heater package shall be supplied with a local control and instrument panel mounted on the skid, including all necessary safety shutdowns. The controls shall be fully automatic. Heater element(s) energizing shall be in increments of 20-percent (20%) of rated kW load to avoid placing a large step load on the ship service generating plant and short cycling.

61.6 INSULATION AND LAGGING

Insulation and lagging of the electric and oil-fired heater casings shall be furnished as part of the heaters.

See Section 73 of the Technical Specification for the general requirements for pumps, Section 74 of the Technical Specification for general piping and material requirements and Section 75 for insulation and lagging requirements.

61.7 INSTALLATION

Each hot water heating unit shall be mounted on a suitable foundation in accordance with the requirements of Section 2 of the Technical Specification, with provision for expansion and contraction without straining the heater or the Vessel structure. Piping connections shall not induce a strain on heater connections due to thermal expansion and/or misalignment of piping.

Before filling the hot water heaters, they shall be thoroughly flushed with clean fresh water in accordance with Section 74 of the Technical Specification. Water used for filling shall be treated in accordance with the requirements Section 60 of the Technical Specification.

61.8 SPARE PARTS AND INSTRUCTION MANUALS

Provide a list of recommended spare parts and special tools for those items which are Contractor furnished, together with parts lists and instruction manuals necessary to maintain

and service provided equipment and accessories in accordance with the requirements of Sections 86 and 100 of the Technical Specification.

61.9 TESTS, TRIAL AND INSPECTIONS

Each hot water heater shall be shop tested according to the requirements of the USCG and the ABS. In the Vessel it shall be tested hydrostatically. The units shall be tested to demonstrate proper operation, including automatic control, flue gas analysis, and firing rate.

Test and/or trials shall be in accordance with this Section and Section 101 of the Technical Specification.

Inspections shall be performed as defined in this Section and Section 1 of the Technical Specification.

61.10 PHASE II TECHNICAL PROPOSAL REQUIREMENTS

The following calculations, in addition to other deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase II Technical Proposal stage of Work in accordance with the requirements of Section 100 of the Technical Specification:

A. Oil-fired Hot Water Heater sizing calculations.

B. Electric Hot Water Heater sizing calculations.

See Section 100 of the Technical Specification for additional requirements regarding technical documentation.

61.11 PHASE III DETAIL DESIGN AND CONSTRUCTION REQUIREMENTS

The following calculations, in addition to other deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase III Detail Design stage of Work in accordance with the requirements of Section 100 of the Technical Specification:

A. Oil-fired Hot Water Heater sizing calculations

B. Electric Hot Water Heater sizing calculations

C. Burner Control System Schematic

See Section 100 of the Technical Specification for additional requirements regarding technical documentation.

(END OF SECTION)